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Title:	Approximating Line Losses and Apparent Power in AC Power Flow Linearizations
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Approximating Line Losses and Apparent Power in AC Power Flow Linearizations

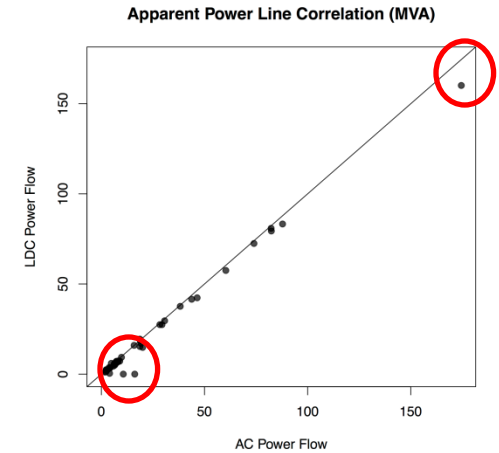
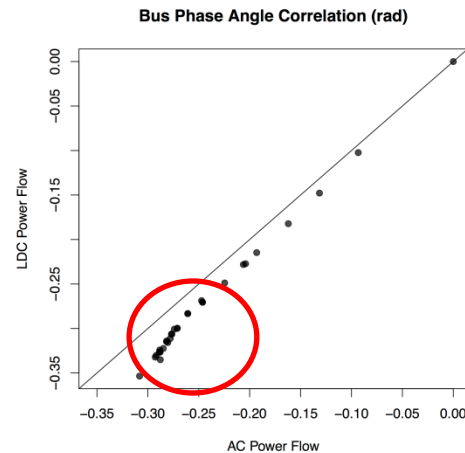
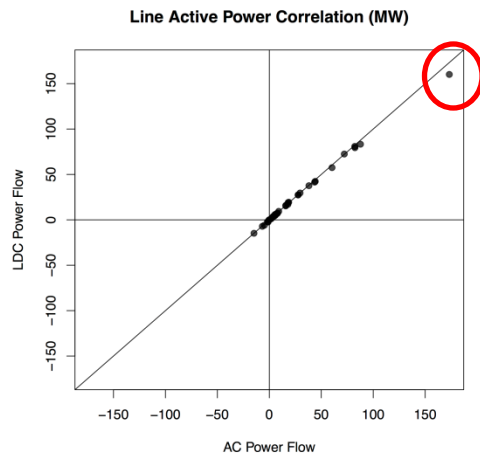
Carleton Coffrin, Pascal van Hentenrck, and
Russell Bent

DC approximation

- The linear DC model is often used to approximate non-linear AC modes
- Known approximation issues
 - R/X ratios (Purchala 05)
 - Line losses (stott 09)
 - Suceptance calculations (Stott 09)
 - Application context (Stott 09)
 - Aggregate decision making (Overbye 04)
- Improved DC approximations
 - Line losses
 - Voltage magnitudes
 - Apparent power

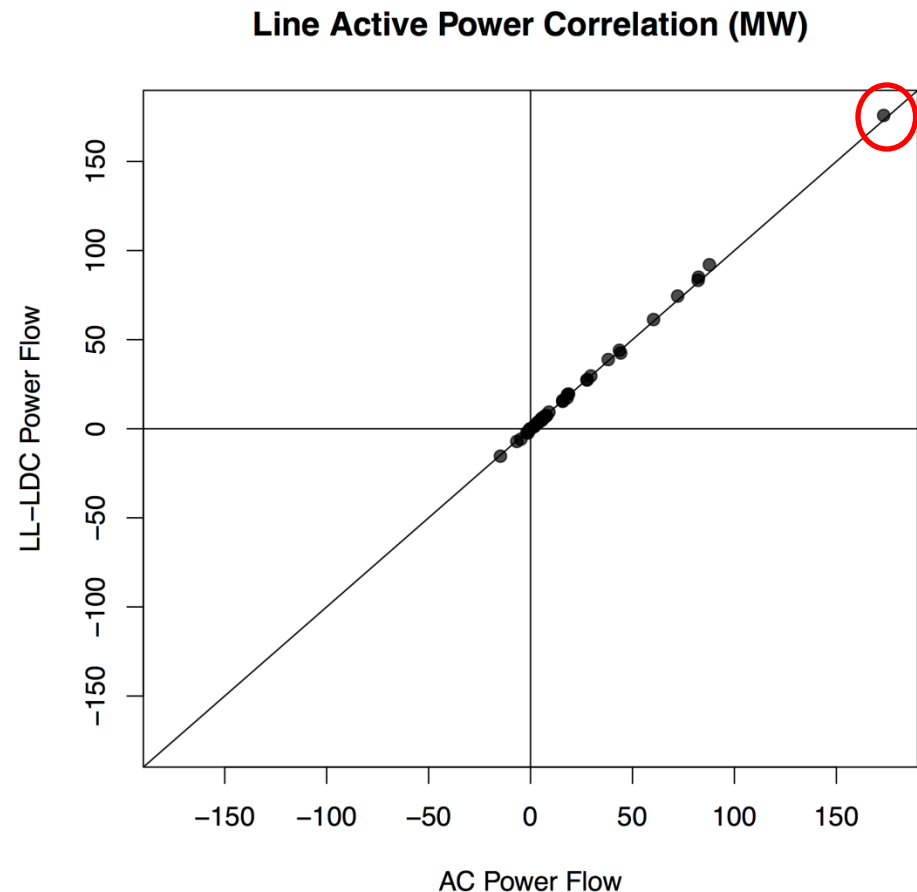
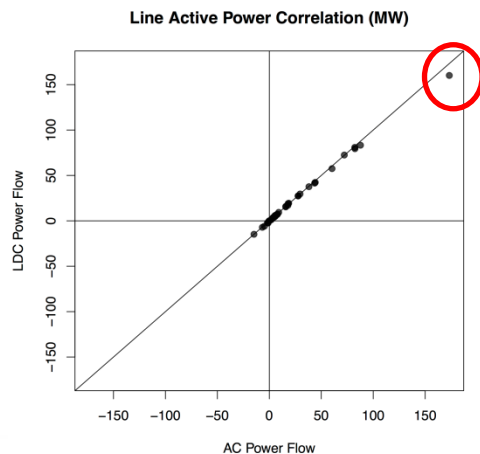
AC and DC Power Flow Correlations

- IEEE 30 benchmark



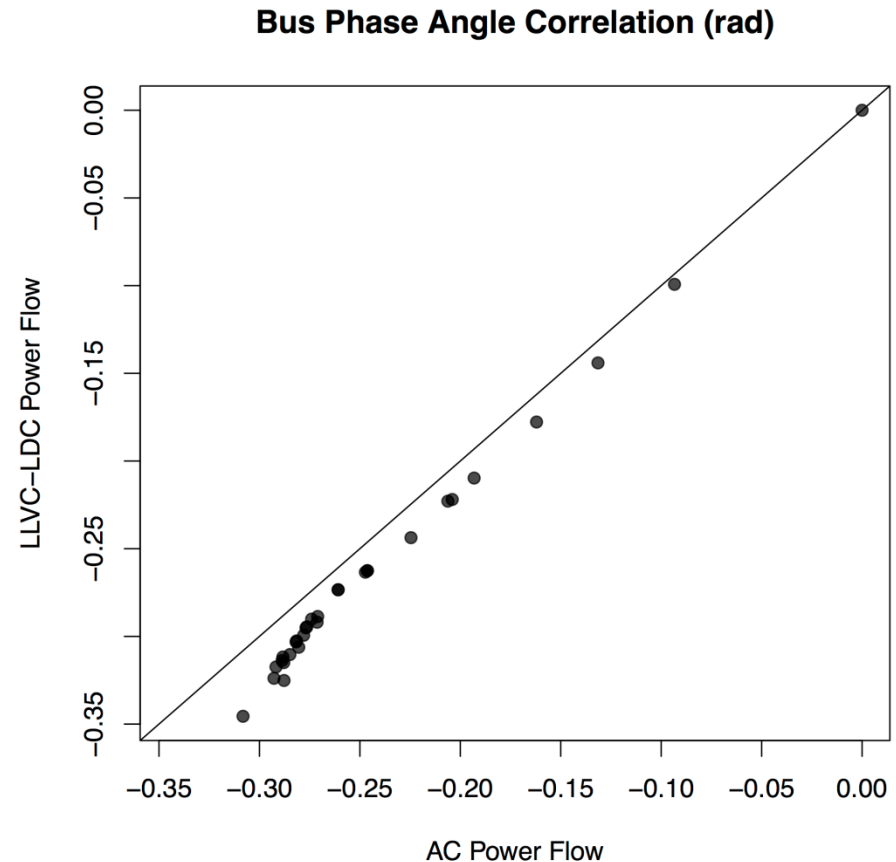
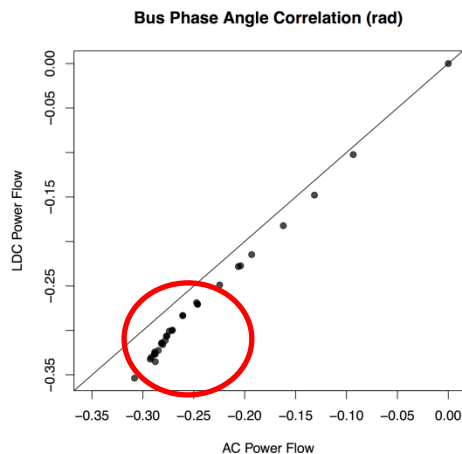
DC Approximation with Line Losses

- Integrate line losses into DC models using a convex approximation of the quadratic line loss function



DC Approximation with Voltage Magnitudes

- Voltages from a previous AC solution used as constant voltages in the DC model
- Some increased accuracy, but room for improvement



DC Approximation with Apparent Power

- Correlate active power with apparent power
- Approximate apparent power with convex functions of the bus-phase angles

